

Nucleus and Radiation (Chapters 30 and 31)

Rutherford found that there was a dense, positive area in the atom, the nucleus.

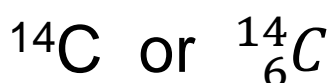
The nucleus has protons and neutrons (made up of quarks).

The atomic number, Z , is the number of protons in the nucleus, dictating the element and the chemical properties.

The atomic mass number, A , is the number of protons and neutrons.

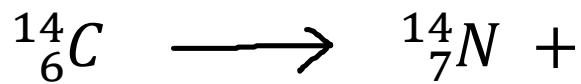
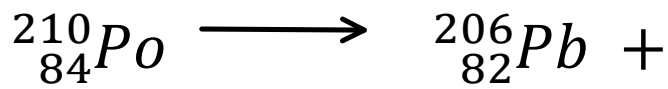
Isotopes are atoms with the same number of protons but different number of neutrons. They have essentially the same chemical properties.

eg. carbon 12 has 6 protons and 6 neutrons while carbon 14 has 6 protons and 8 neutrons



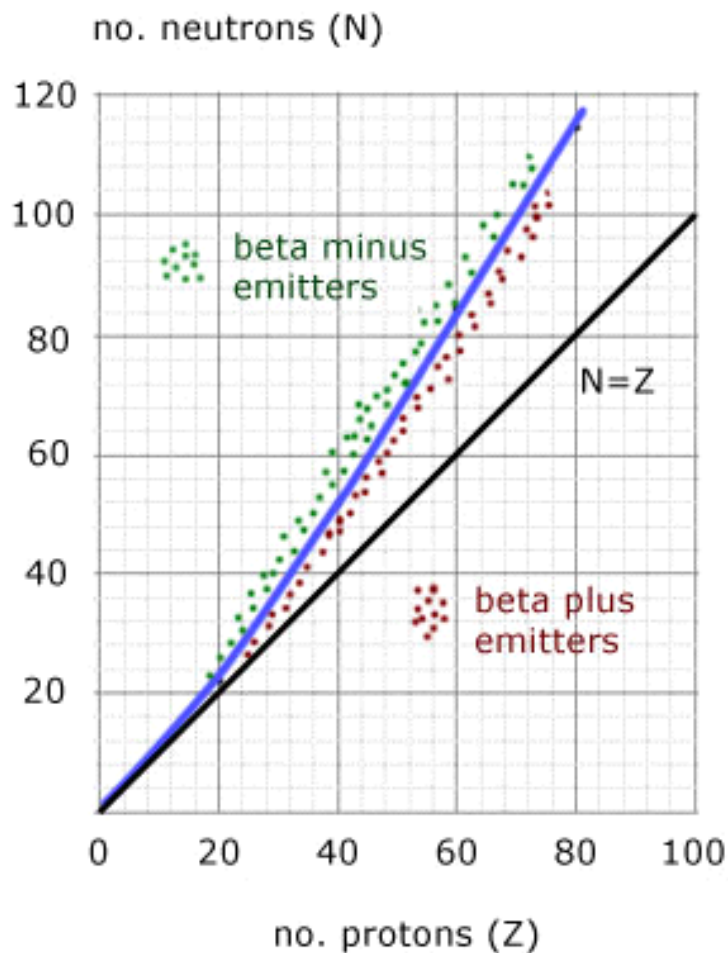
p618 Q1-4 and define α , β , γ decay

complete the decay equation:



Some isotopes are unstable, so they give off a particle or energy to become stable. This is natural radioactivity.

blue line is stable isotopes



Nuclear stability

When a graph of neutron number (N) against proton number (Z) graph is plotted for all known nuclides - fig 1 is obtained.

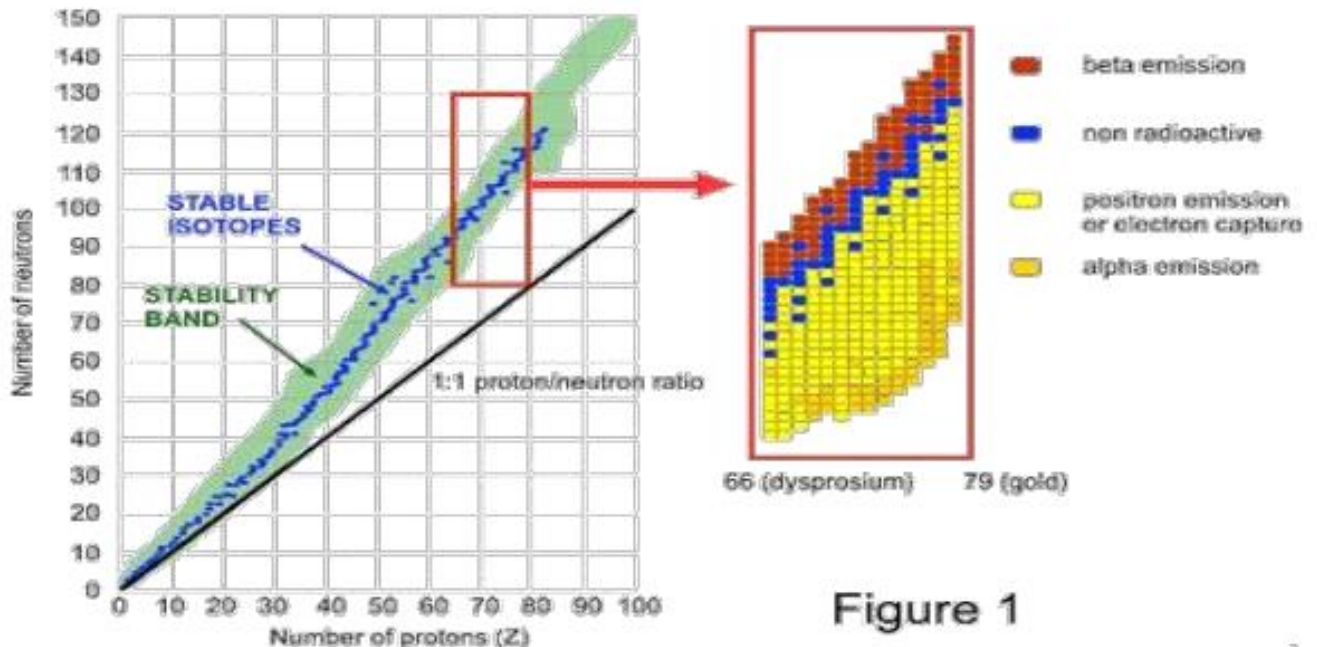


Figure 1

2

Alpha decay, α

A helium 4 nucleus is emitted from the nucleus.
Low penetration - blocked by paper or skin.

Poisonous -

Beta decay, β

2 types, beta negative and beta positive

1. beta negative is when an electron and anti-matter neutrino is emitted from the nucleus when a neutron is changed into a proton (up quark changes into a down quark) and some

energy is changed into the mass of the particles.

2. beta positive is when a positron (an anti-matter electron) and neutrino are produced when a proton changes into a neutron.

neutrinos are highly unreactive particles, only interact by the weak nuclear force.

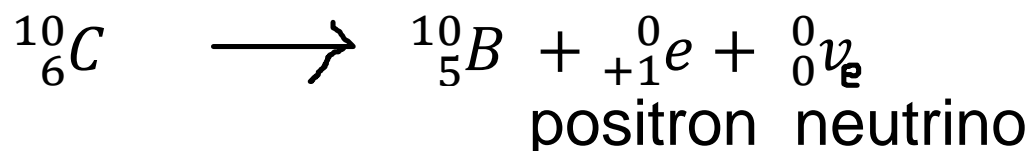
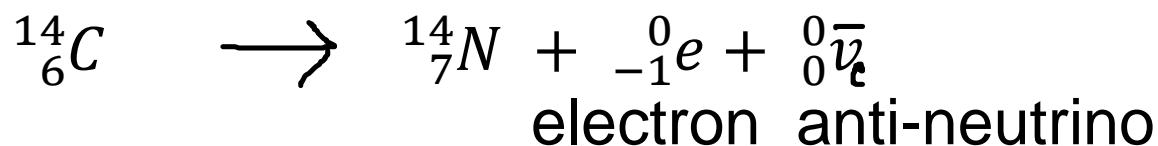
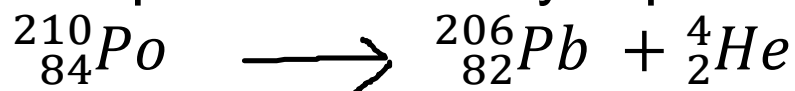
symbol for neutrinos are greek letter nu, ν

Gamma, γ

electromagnetic radiation, high energy photons with high frequency.

$$E=hf$$

complete the decay equation:



anti-matter has the same mass as corresponding matter but opposite charge and quantum numbers

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page of research notes for your presentation